

7.2

Similar Polygons

Goal Identify similar polygons.

VOCABULARY

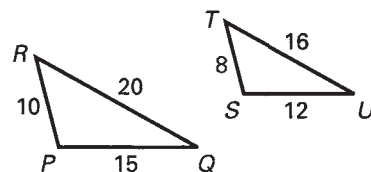
Similar polygons

Scale factor

Example 1 Use Similarity Statements

$\triangle PRQ$ and $\triangle STU$ are similar.

- List all pairs of congruent angles.
- Write the ratios of the corresponding sides in a statement of proportionality.
- Check that the ratios of corresponding sides are equal.



Solution

a. $\angle P \cong \angle \underline{\hspace{1cm}}$, $\angle R \cong \angle \underline{\hspace{1cm}}$, $\angle Q \cong \angle \underline{\hspace{1cm}}$

b. $\frac{ST}{PR} = \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$

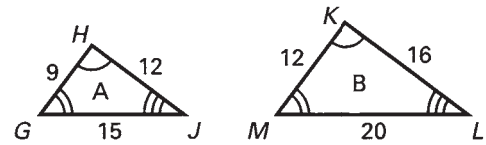
- c. Write the ratios of corresponding sides and simplify.

$$\frac{ST}{PR} = \underline{\hspace{1cm}}, \frac{TU}{RQ} = \underline{\hspace{1cm}}, \frac{US}{QP} = \underline{\hspace{1cm}}$$

The ratios of corresponding sides are all equal to $\underline{\hspace{1cm}}$.

Example 2**Determine Whether Polygons are Similar**

Determine whether the triangles are similar. If they are similar, write a similarity statement and find the scale factor of Figure B to Figure A.

**Solution**

1. Check whether corresponding angles are congruent.

From the diagram, $\angle G \cong \angle \underline{\hspace{1cm}}$, $\angle H \cong \angle \underline{\hspace{1cm}}$, and $\angle J \cong \angle \underline{\hspace{1cm}}$.
So, the corresponding angles are $\underline{\hspace{2cm}}$.

2. Check whether corresponding side lengths are proportional.

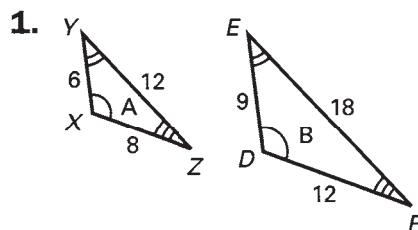
$$\frac{MK}{GH} = \underline{\hspace{1cm}}, \quad \frac{KL}{HJ} = \underline{\hspace{1cm}}, \quad \frac{LM}{JG} = \underline{\hspace{1cm}}$$

All three ratios are equal, so the corresponding side lengths are $\underline{\hspace{2cm}}$.

Answer By definition, the triangles are $\underline{\hspace{1cm}}$. $\triangle GHJ \sim \triangle \underline{\hspace{1cm}}$.

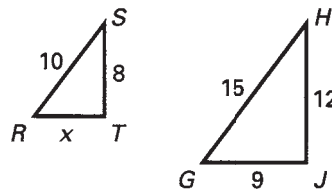
The scale factor of Figure B to Figure A is $\underline{\hspace{1cm}}$.

- ✓ **Checkpoint** Determine whether the polygons are similar. If they are similar, write a similarity statement and find the scale factor of Figure B to Figure A.



Example 3 *Use Similar Polygons*

$\triangle RST$ is similar to $\triangle GHJ$. Find the value of x .

**Solution**

Because the triangles are similar, corresponding side lengths are proportional.

$$\frac{GH}{RS} = \underline{\hspace{2cm}} \quad \text{Write a proportion.}$$

$$\underline{\hspace{2cm}} = \underline{\hspace{2cm}} \quad \text{Substitute.}$$

$$\underline{\hspace{2cm}} = \underline{\hspace{2cm}} \quad \text{Cross product property}$$

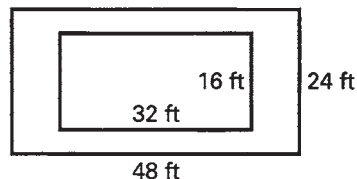
$$\underline{\hspace{2cm}} = \underline{\hspace{2cm}} \quad \text{Multiply.}$$

$$x = \underline{\hspace{2cm}} \quad \text{Divide each side by } \underline{\hspace{2cm}}.$$

Example 4 *Perimeters of Similar Polygons*

A pool and the patio around the pool are similar rectangles.

- a. Find the ratio of the length of the patio to the length of the pool.
- b. Find the ratio of the perimeter of the patio to the perimeter of the pool.

**Solution**

- a. The ratio of the length of the patio to the length of the pool is

$$\frac{\text{length of patio}}{\text{length of pool}} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}.$$

- b. Perimeter of patio = $\underline{\hspace{2cm}}$ = $\underline{\hspace{2cm}}$ feet

$$\text{Perimeter of pool} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \text{ feet}$$

The ratio of the perimeter of the patio to the perimeter of the

$$\text{pool is } \frac{\text{perimeter of patio}}{\text{perimeter of pool}} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}.$$

Follow-Up

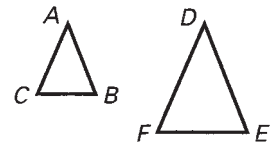
In Example 4, what do you notice about the ratio of the lengths and the ratio of the perimeters?

THEOREM 7.1: PERIMETERS OF SIMILAR POLYGONS

Words If two polygons are similar, then the ratio of their perimeters is equal to the ratio of their corresponding _____.

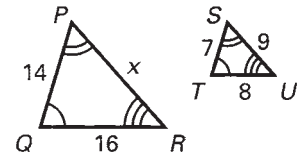
Symbols If $\triangle ABC \sim \triangle DEF$, then

$$\frac{DE + EF + FD}{AB + BC + CA} = \frac{DE}{AB} = \underline{\hspace{1cm}} = \underline{\hspace{1cm}}.$$



✓ **Checkpoint** In the diagram, $\triangle PQR \sim \triangle STU$.

2. Find the value of x .



3. Find the ratio of the perimeter of $\triangle STU$ to the perimeter of $\triangle PQR$.